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SUSTAINABLE DEVELOPMENT AND ENVIRONMENTAL MANAGEMENT – SOUTHEAST ANATOLIA PROJECT EXAMPLE

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ABSTRACT

The Southeastern Anatolia Project, namely the GAP Project, is an integrated multi-sectoral development project implemented in the southeast of Turkey. Being the largest and the most comprehensive development venture undertaken in Turkey, the GAP Project constitutes the driving force for the socio-economic development of the region and also of the country. The most serious weakness of the GAP Project is that neither a local natural resources inventory nor a potential environmental impact master plan (actual ecological and biological master plan) has been made. Given that various sectors to be established in the region and their functions will reflect to the physical spaces, the negative impacts which will affect the most important elements of the geographical space, namely soil, water, flora and fauna ecosystems, must be examined in order to take preventive measures in advance. Development of political and legal framework, in order to prepare and apply ecological plans for ensuring the sustainability of the biological and ecological diversity formed by the natural resources spectrum of the Southeastern Anatolia Region, must be considered a very important and vital move in terms of rational utilization and management of the national, regional and local areas. This paper discusses the realization of integrated regional planning activities in relation to natural resource management and to the principles of the GAP Project.

INTRODUCTION

Globalization process that leads to the New World order of our times, has an economic, ecological and political content in line with the functions undertaken. The global system hinges upon national and international actors as well as the compromise among them. In this framework, environmental problems went far beyond the borders of any country, region and local areas and thus had an impact on the world as a whole, globalizing the responsibilities to a wide extent.

Development of agriculture and energy together with demographic growth and environmental problems has rendered international relations important. Economic development is favoring developed countries and putting the developing countries in a more difficult situation than ever. The fact that almost 75 % of international trade is among developed countries, constitutes an evidence of the economic difficulties faced by developing countries. It is obvious that abuse of the natural environment in various forms in developed countries for further development and in developing countries only for survival, has a negative impact on sustainable development.

On the verge of the year 2000, a common opinion is that the relationship between development and environment can be maintained through policies and implementation tools. It is claimed that the new economic balance can be harmonized with environmental components without forsaking development.

Industrial production receives constant support by giving rise to the need for energy and water which constitutes a global problem. In this context, in order to sustain socioeconomic development and improve quality of life, it becomes inevitable to consider natural environment as the sole capital. Therefore, the key to ensure sustainable development and economic viability of environmental resources is to integrate environmental values and costs into economic decisions and policies. In other words, in order to sustain long-term socio-economic activities and to ensure an optimum balance, it is necessary to consider the relationship between the relevant industries and natural resources and to measure the maximum capacity. In fact, integration of the environmental dimension to the decision-making mechanisms leads to short and long term strategies for environmental protection.

Therefore, considering the ecological and economic decisions in line with the interdependent eco-systems of different countries within the macro space is an important reference step for regional and sector-based planning activities regarding proper and efficient use of natural resources and conservation of vulnerable regions.

Such a planning approach is important since ecological space components at national and international levels within political decision processes influence regional development and investment policies. For this reason, when preparing a national planning policy, ecological and economic principles should be considered with regard to the international space dimension and the necessary legal and political framework should be provided for global sustainability.

In this context, the Southeastern Anatolia Project introduced for the most underdeveloped region, the southeast of the country – the GAP is the largest project concerning water and energy resources in a developing country, Turkey. Within this project, an integrated and coordinated program and planning activities are foreseen in the region regarding agriculture, industry, education, health, infrastructure, transportation and communication.

As it is known, with its international river basins, forests and soil, the Southeastern Anatolia Region is quite a vulnerable region in terms of ecological and political components.

THE GAP PROJECT

The Southeastern Anatolia Project (GAP) aimed primarily to generate the necessary electric power for the country and to meet the water supply demand of agricultural fields in the region and then, to strengthen the socio-economic structure of the urban and rural settlement areas within the nine provinces located in the southeast region of Turkey, and thus, to reduce the number of people migrating from the east to the west of Turkey. The Project ranking also among the largest five development plans in the World at present, draws the attention of many countries in ecological, economic, social and political terms.

The southeast region of Turkey where the Project is underway, has a surface area of 73,836 m² representing 9.5% of the total area of this country and 8.5% of the total population. Annual average population growth rate in Turkey is 2.4%, increasing to 3.0% in this region. Population estimated for the year 2005 for this region is 17 million and it is calculated that approximately 2 million people will be living in the metropolitan areas of this region, and 2-3 million people in suburban areas close to these metropolitan areas (see Table 1).

TABLE 1: ESTIMATED POPULATIONS OF URBAN AND RURAL AREAS OF THE GAP REGION

	URBAN			RURAL			Total
City	**1985**	**1990**	**2005**	**1985**	**1990**	**2000**	**2005**
ADIYAMAN	157,963	219,299	406,855	278,927	293,827	248,035	654,820
BATMAN	147,043	193,621	380,750	136,436	151,058	184,762	565,512
DIYARBAKIR	480,964	600,640	1,579,025	461,864	494,356	726,347	2,305,373
GAZIANTEP	651,713	821,181	1,903,519	323,552	319,467	602,152	2,505,671
MARDIN	205,453	249,420	546,822	300,199	308,615	482,342	1,029,164
SANLIURFA	407,184	551,124	1,362,707	388,779	450,331	1,078,791	2,441,498
SIIRT	90,885	110,139	189,580	161,585	133,296	198,022	387,602
SIRNAK	73,257	125,264	264,994	129,187	136,742	288,061	553,055
TOTAL	**2,210,367**	**2,870,689**	**6,634,255**	**2,180,529**	**2,287,772**	**3,808,509**	**10,442,765**

Source: GAP-Regional Development Administration (1998)

DEVELOPMENT TARGETS, PURPOSES AND STRATEGIES FOR THE SOUTHEAST REGION

The development plan divides the development targets, purposes and strategies for the southeast region into three main groups with regard to the local circumstances, resources, present problems, and the overall national development targets (see Schema 1).

As set out in these targets, purposes and strategies, two basic factors are taken into consideration in order to increase agricultural productivity and the quality of urban services for the purpose of ensuring the economic development to be sustainable by making certain structural changes:

- Economic structure of the region
- Interaction of urban and rural areas

The targets, purposes and strategies set out in the development plan, which is based on these two basic factors, will be reviewed in three main groups as follows:

SCHEMA I-DEVELOPMENT PLAN FOR THE GAP REGION

PURPOSE	TARGET	STRATEGY
-Generating electrical power for overall demand in Turkey	-Building 22 dams and 19 hydro-electric power plants	-Developing industries based on water resources, soil and agriculture;
-Meeting the water supply demand of the region	-Irrigating agricultural fields covering a total surface area of 1.7 million hectares	-Cultivating plants suitable for geographical characteristics of the region; developing the most suitable production techniques and operating systems
-Raising economic and socio-cultural levels of the region and its sub-regions	-Increasing industrial development potential of the region; testing types of industry, selection of sites and possible environmental effects	-Giving priority to industries based on agriculture and natural resources; encouraging manufacturing industries
-Developing the agricultural sector, increasing the rural productivity and agricultural employment	-Preparing plans of the urban settlement areas and landscaping	-Developing service sectors serving to other sectors; improving the social and urban infrastructure as necessary
-Developing industrial and trade sectors, encouraging exportation of local goods	-Determining requirements and sizes of urban and rural technical and social infrastructure; realizing them in pilot areas	
-Building and developing the infrastructure of metropolitan areas and other cities in the region.	-Accelerating projecting of transportation requirements	

The GAP Project is an enormous project aiming at the integration of socio-economic planning activities at national, regional and local levels.

The aim of the Project is to improve the region's economic structure with increasing its income level, and to eliminate ethnical problems and terrorism, which hinder the development of most parts of the region, by reducing the discrimination between the income levels of this region and other regions.

In this context, it is also aimed to increase the regional agricultural productivity and employment, to increase demographic capacity of the cities, to achieve a continuous economic growth which can sustain itself by using the regional resources in an efficient manner, to encourage exportation of locally manufactured goods, and to

establish a stable social system. Thus, it can contribute to realization of other development targets in the national level.

Three alternative scenarios have been set out as the development strategy in the GAP master plan:

Scenario I: Agricultural fields covering a total area of 1,7 million hectares will be irrigated and a total of 26,000-kW/h electrical power will be generated.

Scenario II: Priority will be given to agricultural fields selected from an economical point of view, so that about 900,000 hectares will be irrigated.

Scenario III: Priority will be given to selected irrigation and power generation projects only for economic purposes, the remaining projects will be postponed to 2005.

It is assumed that the construction sector will thrive as employment expands and as the socio-economic development leads to urbanization both in the metropolitan areas and in their suburban communities as well as satellite settlements and rural areas. The Construction sector with its side industries will create considerable employment and it is estimated that by 2005, sectoral distribution of employment in this region will converge to national sectoral distribution.

Statistical evaluations made for the agricultural sector indicate that the GAP Project will have its biggest impact on the rural areas in terms of employment.

EMPLOYMENT AIMED FOR THE SOUTHEAST REGION

Considerable job and employment opportunities will be created in this region after the GAP investments are completed. In other words, the agricultural, mining, construction, service and manufacturing industries will secure the biggest increase of manpower in this region. The main purpose of the GAP is to increase employment capacities of agricultural and agricultural industries and, therefore, it is estimated that,

by 2005, above mentioned sectors will attract a considerable aggregation of manpower in this region in particular (see Table 2)

TABLE 2: REGIONAL EMPLOYMENT IN THE TARGET YEAR (2005)

Sectors	**REGION**		**URBAN**		**RURAL**	
	Number	Rate (%)	Number	Rate (%)	Number	Rate (%)
Agriculture	1,974,001	51.01	138,477	8.08	1,835,524	85.12
Mining	5,005	0.13	3,808	0.22	1,197	0.06
Manufacturing	371,900	9.61	331,160	19.33	40,740	1.89
Total	2,350,906	60.75	473,445	20.15	1,877,461	87.06
EGS	11,072	0.29	9,038	0.53	2,034	0.09
Construction	250,577	6.47	204,553	11.94	46,024	2.13
Commerce	346,206	8.95	282,617	16.49	63,589	2.95
UHD	115,996	3.00	94,691	5.53	21,305	0.99
Service	795,317	20.55	649,238	37.89	146,079	6.77
Total	1,519,168	39.25	1,240,137	72.37	279,031	12.94
Grand Total	3,870,075	100.00	1,713,583	100.00	2,156,492	100.00
Population	10,442,764		6,634,255		3,808,509	

Source: GAP-Regional Development Administration (1998)

FUNCTIONS AIMED FOR THE SOUTHEAST ANATOLIA REGION

Total potential volume of the water resources of the Euphrates and Tigris, which are the biggest rivers in the southeastern Anatolia region, and of their numerous streams is 43 km^3. 22 dams and 19 hydroelectric power plants are under construction in this region in the present, having a total power of 7560 mW, some of which are about to be completed. Furthermore, 19 hydroelectric power plants will generate a total power of approximately 27 billion kW/h. Total power capacity of Turkey is 122 billion kW/h, 16.2 billion kW/h of which will be generated by the Karakaya and Atatürk dams. 25 irrigation projects and 13 other projects will provide multi-functional services; it is especially planned to irrigate agricultural fields covering a total surface

area of 1.7 million hectares (19 % of Turkey‘s agricultural land). As of the end of 1997, a total agricultural land of 154,000 hectares is irrigated within the basins of the Euphrates and Tigris, so that irrigation-based agricultural products are cultivated now. Thus the regional agricultural pattern has undergone a considerable change, and the farmers are now able to harvest especially cotton, oil seeds and fodder plants twice a year.

Industrial development targets of the GAP Project include improvement and support of the industries utilizing locally produced raw materials, and thus creating employment by establishing industrial plants in every province.

Industrial projects designed for the development of local resources such as petroleum, phosphate, asphaltite, copper, coal, chromite, marble, dolomite, lime, iron, simple brick and roof tile, and spas are being carried out at present and when completed, these plants will create considerable employment (see Table 3).

In the urban areas, agriculture-based manufacturing industries and those industries, which provide input for the agricultural sector, are being developed. Terror activities committed by the illegal organizations in certain areas of the region cause an important migration from rural areas to urban areas. It is the metropolitan areas of the region which attract these local migrants, so that greater needs are generated in housing, employment, education, healthcare and infrastructure.

TABLO 3: MINES IN THE GAP REGION

Mine	Total Reserve (million ton)	Locations	Present Situation
Raw oil	53.40	Adiyaman, Diyarbakir, Gaziantep, Siirt,Sirnak, Sanliurfa	In operation
Natural gas (m^3)	20,000	Siirt	In operation
Phosphate	70.50	Mazidagi (Mardin)	In operation
Asphaltite	82.00	Sirnak	In operation
Copper	28.50	Siirt	Idle
Coal	57.30	Adiyaman, Diyarbakir	
Cement raw materials: -limestone -clay -marn	 84.00 70.40 43.50	Adiyaman, Diyarbakir, Mardin, Siirt, Sanliurfa	
Chromite	0.06	Diyarbakir, Gaziantep, Siirt	In partial operation
Marble	Unknown	Adiyaman, Gaziantep, Siirt, Diyarbakir, Mardin	unknown
Brick/Roof Tile Materials	86.00	Adiyaman, Diyarbakir, Siirt, Sanliurfa	In partial operation
Thermal water	Flow rate 1-20 liter/second	Adiyaman, Diyarbakir, Mardin, Siirt	In partial operation
Salterns	Unknown	Siirt	In operation
Barytes	0.78	Siirt, Diyarbakir	Idle
Light construc-tion materials	63.70	Sanliurfa	Idle
Manganese	0.38	Adiyaman, Gaziantep	In partial operat.
Iron ore	121.32	Adiyaman, Gaziantep	Idle
Lime materials:- limestone Flintstone	 48.00 unknown	Diyarbakir, GaziantepDiyarbakir, Mardin	Idle In partial operation
Lead/zinc ore	0.44	Diyarbakir, Siirt	Idle
Dolomite	40.00	Gaziantep	Idle
Bauxite	95.80	Gaziantep	Idle
Asphaltic limestone	unknown	Gaziantep	Idle

Source: GAP-Regional Development Administration (1998)

The fact that the dams flooded a considerably wide land leads to the renewal of transportation routes and considerably large lands are required for organized industrial zones, international airports, container warehouses and other infrastructure facilities. Transition from dry farming to irrigated farming will require a change of culture and in this process it is vital to ensure that the peasants to turn into modern farmers for the sake of protecting natural resources. Objectives determined for technological development, economic growth, social development or environmental protection would contain only the themes falling within their scopes. However, the strategies selected for realizing these objectives, which were determined from only one viewpoint, in an ideal manner can contradict with other strategies determined for different objectives. Given that the quality of life and survival of all living creatures are in a serious danger today, it is obvious that these plans which are ideal for their objectives will cause a wide range of environmental problems.

THE GAP PROJECT AND POTENTIAL ENVIRONMENTAL PROBLEMS

It is evident that the development and improvement projects designed for the region, are likely to cause a wide range of environmental problems. The most serious weakness of the GAP Project is that neither a local natural resources inventory nor a potential environmental effect master plan (actual ecological and biological master plan) has been made. Neither biotope maps reflecting the actual ecological and biological characteristics of the regional natural resources, nor maps indicating potential ecological problems which might be caused by the establishment of various sectors and their functional areas, nor master plans containing measures to be taken for preventing or reducing such effects have been prepared, and this situation does not suit the current planning practices.

It is obvious that the environmental impact assessment should be realized as a part of the regional planning process for a foreseen sectoral development of the region with a socio-economic framework. Therefore, the socio-economic sectors of the GAP Project which is underway and does not have any risk assessment, will cause a wide range of environmental problems in a very short time.

In this context, sources of these above mentioned environmental problems which will arise from the physical planning can be summarized as follows (see Table 4).

TABLE 4: SOURCES OF POTENTIAL NEGATIVE IMPACTS OF THE GAP PROJECT

Population increase – population movements	**Agricultural activities**	**Construction works for various sectors**	**Industrial works**
-Natural population increase -Population movements within the region -Urbanization *New settlement areas *Demographic intensification and functional change of the existing settlement areas -Infrastructure *Transportation *Sewage *Power *Water *Telecommunications *Heating *Solid waste -Socio-cultural needs and events	-Types of agriculture -Field works and techniques unsuitable for the topographic structure -Utilization of artificial fertilizers -Utilization of harmful pesticides -Transportation -Irrigation techniques -Water supply	-Housing -Industry, raw material production -Trade -Transportation *Land *Sea *Air -Tourism -Infrastructure -Water supply	-Industrial enterprises -Manufacturing technology -Storage of industrial products -Solid and liquid waste materials -Power transmission lines and centers -Transportation -Water supply - Natural gas pipeline

Given that various sectors to be established in the region and their functions will reflect to the physical spaces, the negative impacts which will affect the most important elements of the geographical space, namely soil, water, flora and fauna ecosystems, must be examined in order to take preventive measures in advance.

A) IMPACTS OF THE GAP PROJECT ON THE REGIONAL ECOSYSTEM

All of the agricultural fields to be irrigated within the GAP Project are calcareous and their $CaCO_3$ content varies between 5 % and 85% . The soil in which organic material content varies between 0.1 and 4.8% is of a poor quality. Albeit its potassium rate is quite high at 380 – 1,740 mg, this characteristic cannot transform it into a fertile soil because of high lime content.

With regard to cavities inside the soil, it is expected that excess irrigation will cause the soil to compress as a result of high clay content. Therefore, it is important to prepare an irrigated farming plan on the soil-water-vegetation relations in order to obtain maximum yield from these agricultural fields.

It is obvious that environmental conditions of the regional agro-ecosystem will change due to irrigation, and this change will have considerable negative impacts on the diversity of species and biotopes of the agro-ecosystem.

In order to protect the diversity of the existing and planned agro-ecosystem, it is important that both agricultural techniques and various processes (e.g. utilization of pesticides and artificial fertilizers) must be planned and carried out in an integral framework, and the farmers must be instructed on these matters. Otherwise, underground waters will be polluted with nitrates and phosphates, and this pollution will, in turn, lead to degradation of vegetable and animal products.

B) IMPACTS OF THE GAP PROJECT ON THE REGIONAL FLORA

The southeast region of Anatolia differs substantially from the other regions of Turkey in terms flora in relation to its climatic conditions and geomorphologic structure.

This region is located within the Mesopotamia sub-region of the Iranian-Turan floral region, and mostly, consists of the Iranian-Turan originated steppe vegetation.
Although this region is very rich in floral terms, most of the species have not been inventoried yet. Until now, species such as Teucrium, Iris, Allium, Apiacea, Fabacede, Isatis and Geophytes etc. have been discovered. In addition to these species Anthemis (46%), Rosa (56.4%), Astragalus (38%) and Helichrysium (37.5%) inhabit in the region.

Endemic species specific to the region consist of 240 varieties. Since these species have not been inventoried and their threshold fields have not been planned, it is obvious that agriculture, industry, settlements, transportation, infrastructure, tourism, raw material production and solid waste will have a negative impact on the local flora or destroy it, and thus cause the genes to vanish over the time.

C) IMPACTS OF THE GAP PROJECT ON THE REGIONAL FAUNA

It is obvious that when the arid soil of the region is irrigated and the system of dams form large water masses, the region will experience a transition from an arid and hot climate into a moist and temperate climate, so that its flora and fauna structures will endure a considerable change.

It is expected that protozoa, mollusca, insecta, pisces, reptilia, aves and mammalia species will change and experience a process of redevelopment. It is also assumed that insecta, reptilia, mollusca, mammalia and protozoa species that have a direct or indirect negative impact on agriculture, humans and animals, might evolve and as a result, the living creatures can be affected by various diseases.

D) NEGATIVE IMPACTS OF THE GAP PROJECT ON OTHER NATURAL RESOURCES

It is assumed from the previous experience that while the functional fields (i.e. housing, transportation, industry, tourism, recreation, trade, etc.) of all sectors are under construction and after they are built, the region's topographic, geological, hydrological, soil, flora, fauna and landscaping structures will be influenced in a negative manner, and these negative impacts will bring air, soil, aquatic and visual pollution.

Other important issues include siltation effect in dam basins, and emissions to the soil, underground and aboveground water systems and air, caused by urban solid waste storage fields.

In order to protect the water basins and dams of the region against siltation, it is necessary to afforest the region, to establish green fields in the city centers regulating the climate, and to build solid waste storage and disposal systems.

CONCLUSION AND SUGGESTIONS

Today, efforts made in the world for sustainable ecological and economic developments underline the importance of physical planning, and constitute the concept of ecology-sensitive planning.

In the context of globalization, establishment of interactions between socio-economic development plans and natural spaces, and taking natural and cultural compounds into consideration as a whole are a starting point for developing the concept of country-wide physical plan. This relationship contains a diverse range of research, analysis and planning processes at different levels. Furthermore, geographical space analysis will lead to the collection of data about ecosystems and will bring about the management and sustainability of ecological and economic resources in the planning process of national, regional and local areas.

In this context, studies that should be made while the GAP Project is in progress can be listed as follows:

- Land and aquatic ecosystems of the Southeastern Anatolia Region, and developed biotope networks specific to these ecosystems must be inventoried, and these inventory data must be mapped in appropriate scales.

- Biological, ecological and cultural properties and relations of the basin systems of the rivers and dams located within the regional and local areas and hinterland must be studied, and data collected as a result of such studies must be used for preparing landscaping master plans containing threshold zones, conservation, conservation-utilisation, regeneration and biological recultivation techniques.

- Sectoral plans based on decisions that have been made for conservation-utilisation plans must be prepared in order to allocate the lands.

And these are the most important and indispensable parts of the regional planning process.

Development of political and legal framework, in order to prepare and implement ecological plans for ensuring the sustainability of the biological and ecological diversity formed by the natural resources spectrum of the Southeastern Anatolia Region, must be considered a very important and vital move in terms of rational utilisation and management of the national, regional and local areas.

REFERENCES

Atabay, S.(1998) 'An Environmentally Friendly Physical Planning Method within the Socio-economic Development Process' The Kriton Curi International Symposium on Environmental Management in the Mediterranean Region. Proceedings Volume 1, Bosphorus University.

Atabay, S.(1990) 'A Proposed Method for Tourism Planning in a Regional Context with the Assessment of Natural Resources' International Environmental Cooperation Round-table Discussion between the Republics of Korea, Turkey and the Federal Republic of Germany: Project Transfer of Ecological Know-how, Institut fuer Landschaftsekonomie der TU, Berlin

GAP- REGIONAL DEVELOPMENT ADMINISTRATION (1998) Southeastern Anatolia Project Latest State as of April 1998, Ankara

GAP- REGIONAL DEVELOPMENT ADMINISTRATION (1997) Regional Transportation and Infrastructure Development Study, Ataturk Dam Basin – Research and Analysis Project on Flora and Fauna of Adiyaman, Gaziantep, Sanliurfa and Haran Plains.

GAP- REGIONAL DEVELOPMENT ADMINISTRATION (1993) Regional Transportation and Infrastructure Development Study, Research Project Tigris Basin – Flora – University of Dicle, Diyarbakir

TURKISH ENVIRONMENTAL FOUNDATION (1997) Impacts of the GAP Project on Ecology and Agriculture. TCV publication nr. 125 – Ankara.

TURKISH ENVIRONMENTAL FOUNDATION (1994) Forests and Vegetation in the GAP region. TCV publication - Ankara

Unver, O. (1997) Southeastern Anatolia Project (GAP), International Journal of Water Resources Development, 13(4), pp.453-483